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TITLE: METHOD AND SYSTEM FOR MANAGING REGISTRATION REQUESTS OF TELEMATICS UNITS

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METHOD AND SYSTEM FOR MANAGING REGISTRATION REQUESTS OF TELEMATICS UNITS

FIELD OF THE INVENTION

This invention relates generally to wireless communications with a mobile vehicle. More specifically, the invention relates to a method and system for managing registration requests of a telematics unit within a telematics equipped mobile vehicle.

BACKGROUND OF THE INVENTION

The opportunity to utilize wireless features in a mobile vehicle is ever increasing as the automobile is being transformed into a communications and entertainment platform as well as a transportation platform. Wireless features include wireless vehicle communication, networking, maintenance and diagnostic services for a mobile vehicle.

Typically, conventional wireless systems within mobile vehicles (e.g. telematics units) provide voice communication. Recently, these wireless systems have been utilized to update systems within telematics units, such as, for example radio station presets. Similar to other conventional wireless systems, telematics units within mobile vehicles are required to regularly register with the mobile vehicle communication system (MVCS). This registration is called a registration request. The registration request notifies the MVCS that the telematics unit is operational and is operating within a specified portion of the MVCS.

While the process of performing an individual registration request does not consume a great deal of system power, prolonged operation of registration requests, such as, for example every ten minutes will result in a system energy level reduction below an acceptable threshold. Typically, mobile vehicles are operated frequently enough that the system energy level does not drop below the acceptable threshold. Unfortunately, a prolonged period of mobile vehicle inactivity may result in a system energy level reduction below an acceptable threshold. This outcome is not desirable.

The present invention addresses these and other issues and advances the state of the art.

SUMMARY OF THE INVENTION

One aspect of the invention includes a method for operating a telematics unit within a mobile vehicle communication system including receiving a restricted use command from a service provider, initiating a restricted use mode based on the received restricted use command, and modulating a transmission rate of at least one registration request based on the restricted use mode.

In accordance with another aspect of the invention, a computer readable medium storing a computer program includes: computer readable code for processing a received restricted use command from a service provider; computer readable code for initiating a restricted use mode based on the received restricted use command; and computer readable code for modulating a transmission rate of at least one registration request based on the restricted use mode.

In accordance with yet another aspect of the invention, a system for operating a telematics unit within a mobile vehicle is provided. The system includes means for receiving a restricted use command from a service provider. Means for initiating a restricted use mode based on the received restricted use command is provided. Means for modulating a transmission rate of at least one registration request based on the restricted use mode is also provided.

The aforementioned, and other features and advantages of the invention will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention rather than limiting, the scope of the invention being defined by the appended claims and equivalents thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an operating environment for implementing wireless communication within a mobile vehicle communication system;

FIG. 2 is a block diagram of telematics based system in accordance with an embodiment of the present invention; and

FIG. 3 is a flow diagram of one embodiment of a method of managing mobile handset portability within a telematics equipped mobile vehicle, in accordance with the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates one embodiment of system for data transmission over a wireless communication system, in accordance with the present invention at **100**. Mobile vehicle communication system (MVCS) **100** includes a mobile vehicle communication unit (MVCU) **110**, a vehicle communication network **112**, a telematics unit **120**, one or more wireless carrier systems **140**, one or more communication networks **142**, one or more land networks **144**, one or more client, personal or user computers **150**, one or more web-hosting portals **160**, and one or more call centers **170**. In one embodiment, MVCU **110** is implemented as a mobile vehicle equipped with suitable hardware and software for transmitting and receiving voice and data communications. MVCS **100** may include additional components not relevant to the present discussion. Mobile vehicle communication systems and telematics units are known in the art.

MVCU **110** may also be referred to as a mobile vehicle throughout the discussion below. In operation, MVCU **110** may be implemented as a motor vehicle, a marine vehicle, or as an aircraft. MVCU **110** may include additional components not relevant to the present discussion.

MVCU **110**, via a vehicle communication network **112**, sends signals to various units of equipment and systems (detailed below) within MVCU **110** to perform various functions such as unlocking a door, opening the trunk, setting personal comfort settings, and calling from telematics unit **120**. In facilitating interactions among the various communication and electronic modules, vehicle communication network **112** utilizes network interfaces such as controller-area network (CAN), International Organization for Standardization (ISO) Standard 9141, ISO Standard 11898 for high-speed applications, ISO Standard 11519 for lower speed applications, and Society of Automotive Engineers (SAE) Standard J1850 for high-speed and lower speed applications. Vehicle network **112** may also be referred to as a vehicle bus.

MVCU **110**, via telematics unit **120**, sends and receives radio transmissions from wireless carrier system **140**. Wireless carrier system **140** is implemented as any suitable system for transmitting a signal from MVCU **110** to communication network **142**.

Telematics unit **120** includes a digital signal processor (DSP) **122** connected to a wireless modem **124**, a global positioning system (GPS) unit **126**, an in-vehicle memory **128**, a microphone **130**, one or more speakers **132**, and an embedded or in-vehicle mobile phone **134**. In other embodiments, telematics unit **120** may be implemented without one or more of the above listed components, such as, for example speakers **132**. Telematics unit **120** may include additional components not relevant to the present discussion.

In one embodiment, DSP **122** is implemented as a microcontroller, controller, host processor, or vehicle communications processor. In an example, DSP **122** is implemented as an application specific integrated circuit (ASIC). In another embodiment, DSP **122** is implemented as a processor working in conjunction with a central processing unit (CPU) performing the function of a general purpose processor. GPS unit **126** provides longitude and latitude coordinates of the vehicle responsive to a GPS broadcast signal received from one or more GPS satellite broadcast systems (not shown). In-vehicle mobile phone **134** is a cellular-type phone, such as, for example an analog, digital, dual-mode, dual-band, multi-mode or multi-band cellular phone.

DSP **122** executes various computer programs that control programming and operational modes of electronic and mechanical systems within MVCU **110**. DSP **122** controls communications (e.g. call signals) between telematics unit **120**, wireless carrier system **140**, and call center **170**. In one embodiment, a voice-recognition application is installed in DSP **122** that can translate human voice input through microphone **130** to digital signals. DSP **122** generates and accepts digital signals transmitted between telematics unit **120** and a vehicle communication network **112** that is connected to various electronic modules in the vehicle. In one embodiment, these digital signals activate the programming mode and operation modes, as well as provide for data transfers. In this embodiment, signals from DSP **122** are translated into voice messages and sent out through speaker **132**.

Communication network **142** includes services from one or more mobile telephone switching offices and wireless networks. Communication network **142** connects wireless carrier system **140** to land network **144**. Communication network **142** is implemented as any suitable system or collection of systems for connecting wireless carrier system **140** to MVCU **110** and land network **144**.

Land network **144** connects communication network **142** to client computer **150**, web-hosting portal **160**, and call center **170**. In one embodiment, land network **144** is a public-switched telephone network (PSTN). In another embodiment, land network **144** is implemented as an Internet protocol (IP) network. In other embodiments, land network **144** is implemented as a wired network, an optical network, a fiber network, other wireless networks, or any combination thereof. Land network **144** is connected to one or more landline telephones. Communication network **142** and land network **144** connect wireless carrier system **140** to web-hosting portal **160** and call center **170**.

Client, personal or user computer **150** includes a computer usable medium to execute Internet browser and Internet-access computer programs for sending and receiving data over land network **144** and optionally, wired or wireless communication networks **142** to web-hosting portal **160**. Personal or client computer **150** sends user preferences to web-hosting portal through a web-page interface using communication standards such as hypertext transport protocol (HTTP), and transport-control protocol and Internet protocol (TCP/IP). In one embodiment, the data includes directives to change certain programming and operational modes of electronic and mechanical systems within MVCU **110**.

In operation, a client utilizes computer **150** to initiate setting or re-setting of user-preferences for MVCU **110**. In an example, a client utilizes computer **150** to initiate a restricted use mode (e.g. a low-power mode) that telematics unit **120** in MVCU **110** operates within for a user specified period of time. User-preference data from client-side software is transmitted to server-side software of web-hosting portal **160**. User-preference data is stored at web-hosting portal **160**.

Web-hosting portal **160** includes one or more data modems **162**, one or more web servers **164**, one or more databases **166**, and a network system **168**. Web-hosting portal **160** is connected directly by wire to call center **170**, or connected by phone lines to land network **144**, which is connected to call center **170**. In an example, web-hosting portal **160** is connected to call center **170** utilizing an IP network. In this example, both components, web-hosting portal **160** and call center **170**, are connected to land network **144** utilizing the IP network. In another example, web-hosting portal **160** is connected to land network **144** by one or more data modems **162**. Land network **144** sends digital data to and from modem **162**, data that is then transferred to web server **164**. Modem **162** may reside inside web server **164**. Land network **144** transmits data communications between web-hosting portal **160** and call center **170**.

Web server **164** receives user-preference data from user computer **150** via land network **144**. In alternative embodiments, computer **150** includes a wireless modem to send data to web-hosting portal **160** through a wireless communication network **142** and a land network **144**. Data is received by land network **144** and sent to one or more web servers **164**. In one embodiment, web server **164** is implemented as any suitable hardware and software capable of providing web services to help change and transmit personal preference settings from a client at computer **150** to telematics unit **120** in MVCU **110**. Web server **164** sends to or receives from one or more databases **166** data transmissions via network system **168**. Web server **164** includes computer applications and files for managing and storing personalization settings supplied by the client, such as door lock/unlock behavior, radio station preset selections, climate controls, custom button configurations and theft alarm settings. For each client, the web server potentially stores hundreds of preferences for wireless vehicle communication, networking, maintenance and diagnostic services for a mobile vehicle.

In one embodiment, one or more web servers **164** are networked via network system **168** to distribute user-preference data among its network components such as database **166**. In an example, database **166** is a part of or a separate computer from web server **164**. Web server **164** sends data transmissions with user preferences to call center **170** through land network **144**.

Call center **170** is a location where many calls are received and serviced at the same time, or where many calls are sent at the same time. In one embodiment, the call center is a telematics call center, facilitating communications to and from telematics unit **120** in MVCU **110**. In an example, the call center is a voice call center, providing verbal communications between an advisor in the call center and a subscriber in a mobile vehicle. In another example, the call center contains each of these functions. In other embodiments, call center **170** and web-hosting portal **160** are located in the same or different facilities.

In an example, a client utilizes telematics unit **120** in MVCU **110** to communicate with an advisor in call center **170** to initiate a restricted use mode (e.g. a low-power mode) that telematics unit **120** in MVCU **110** operates within for a user specified period of time. In another example, a client utilizes land network **144** (e.g. a land line) to communicate with an advisor in call center **170** to initiate a restricted use mode (e.g. a low-power mode) that telematics unit **120** in MVCU **110** operates within for a user specified period of time.

Call center **170** contains one or more voice and data switches **172**, one or more communication services managers **174**, one or more communication services databases **176**, one or more communication services advisors **178**, and one or more network systems **180**.

Switch **172** of call center **170** connects to land network **144**. Switch **172** transmits voice or data transmissions from call center **170**, and receives voice or data transmissions from telematics unit **120** in MVCU **110** through wireless carrier system **140**, communication network **142**, and land network **144**. Switch **172** receives data transmissions from and sends data transmissions to one or more web-hosting portals **160**. Switch **172** receives data transmissions from or sends data transmissions to one or more communication services managers **174** via one or more network systems **180**.

Communication services manager **174** is any suitable hardware and software capable of providing requested communication services to telematics unit **120** in MVCU **110**. Communication services manager **174** sends to or receives from one or more communication services databases **176** data transmissions via network system **180**. Communication services manager **174** sends to or receives from one or more communication services advisors **178** data transmissions via network system **180**. Communication services database **176** sends to or receives from communication services advisor **178** data transmissions via network system **180**. Communication services advisor **178** receives from or sends to switch **172** voice or data transmissions.

Communication services manager **174** provides one or more of a variety of services, including enrollment services, navigation assistance, directory assistance, roadside assistance, business or residential assistance, information services assistance, emergency assistance, communications assistance, and managing registration requests. Communication services manager **174** receives service-preference requests for a variety of services from the client via computer **150**, web-hosting portal **160**, and land network **144**. Communication services manager **174** transmits user-preference and other data to telematics unit **120** in MVCU **110** through wireless carrier system **140**, communication network **142**, land network **144**, voice and data switch **172**, and network system **180**.

Communication services manager **174** stores or retrieves data and information from communication services database **176**. Communication services manager **174** may provide requested information to communication services advisor **178**.

In one embodiment, communication services advisor **178** is implemented as a real advisor. In an example, a real advisor is a human being in verbal communication with a user or subscriber (e.g. a client) in MVCU **110** via telematics unit **120**. In another embodiment, communication services advisor **178** is implemented as a virtual advisor. In an example, a virtual advisor is implemented as a synthesized voice interface responding to requests from telematics unit **120** in MVCU **110**.

Communication services advisor **178** provides services to telematics unit **120** in MVCU **110**. Services provided by communication services advisor **178** include enrollment services, navigation assistance, real-time traffic advisories, directory assistance, roadside assistance, business or residential assistance, information services assistance, emergency assistance, communications assistance, and registration request management. Communication services advisor **178** communicate with telematics unit **120** in MVCU **110** through wireless carrier system **140**, communication network **142**, and land network **144** using voice transmissions, or through communication services manager **174** and switch **172** using data transmissions. Switch **172** selects between voice transmissions and data transmissions.

In operation, an incoming call is routed to telematics unit **120** within mobile vehicle **110** from call center **170**. In one embodiment, the call is routed to telematics unit **120** from call center **170** via land network **144**, communication network **142**, and wireless carrier system **140**.

FIG. 2 is a block diagram of a telematics based system in accordance with an embodiment of the present invention. **FIG. 2** shows a telematics based system **200** for managing registration requests of a telematics unit within a telematics equipped mobile vehicle. In **FIG. 2**, the system includes a mobile vehicle **210** having a telematics unit **220** coupled to one or more vehicle system modules **290** via a vehicle communication bus **212**, and a communication network **270**, such as, for example a public switched telephone network (PSTN). Telematics unit **220** further includes a database **228** that contains programs **231**, stored data **232**, updated data **233** and triggers **234**. Vehicle system module (VSM) **290** further includes a program **291** and stored data **292**. In one embodiment, VSM **290** is located within telematics unit **220**. In **FIG. 2**, the elements are presented for illustrative purposes and are not intended to be limiting. System **200** may include additional components not relevant to the present discussion.

Telematics unit **220** is any telematics device enabled for operation with a telematics service provider, such as, for example telematics unit **120** as described with reference to **FIG. 1**. Telematics unit **220** in vehicle **210** is in communication with communication network **270** (e.g. a "PSTN"). Telematics unit **220** includes volatile and non-volatile memory components for storing data and programs. In one embodiment, memory components in telematics unit **220** contain database **228**.

Database **228** includes one or more programs **231** for operating telematics unit **220**, such as, for example, for managing registration requests of a telematics equipped mobile vehicle. In operation, a program module receives a restricted use command from a service provider at updated data **233**. In one embodiment, the restricted use command includes a contact increment including contact information, such as, for example contact initiation information and contact rate information.

In an example, contact initiation information instructs the telematics unit to initiate a registration request modulation at a specific time, for example, within a low transmission activity period (e.g. "off peak"). In another example, contact rate information instructs the telematics unit to modulate the registration request at a specified transmission rate, such as, once per day or once per hour. In one embodiment, the contact increment is implemented as predetermined values as provided by the manufacturer. In another embodiment, the contact increment is implemented as one or more values provided by the communication network, such as, for example a service provider.

In an example, the restricted use command is cached within updated data **233**. The restricted use command is stored at stored data **232**. In one embodiment, telematics unit **220** acts as a data cache for restricted use commands. In another embodiment, program **231** includes software for receiving a restricted use command, initiating a restricted use mode based on the received restricted use command, and modulating a transmission rate of at least one registration request based on the restricted use mode.

In one embodiment, the restricted use mode operates the telematics unit in a low-power configuration, such as, for example operating the telematics unit in a "sleep" mode until the contact rate information instructs the telematics unit to modulate the registration request. In this embodiment, when the telematics unit transmits the registration request, the telematics unit is configured to receive an updated contact increment from the communication network, if provided. If an updated contact increment is not provided, the telematics unit registers with the communication network and resumes "sleep" mode until the next registration request as determined by the contact rate information.

The telematics unit is configured to provide updated telematics information, such as, for example vehicle location and system energy level to the communication network, if the communication network communicates with the telematics unit and the information is requested. In another embodiment, the updated telematics information is automatically provided. The communication between the telematics unit and the communication network is synchronized with a registration request.

Vehicle system module (VSM) **290** is any vehicle system control module having software and hardware components for operating, controlling or monitoring one or more vehicle systems. In one embodiment, VSM **290** is a global positioning system (GPS) module, such as, for example GPS unit **126** of **FIG. 1**. In this embodiment, the global positioning system (GPS) module provides positioning information to the telematics unit. In another embodiment, VSM **290** is a dash integration module, as is known in the art, that provides power management information, such as, system voltage information to the telematics unit. In another embodiment, VSM **290** is a controller for controlling a vehicle system such as, for example, a powertrain control module that provides engine and transmission system information.

Vehicle system module **290** contains one or more processors, one or more memory devices and one or more connection ports. In one embodiment, VSM **290** includes a software switch for scanning received information, such as, for example sensor information to identify that data has been received. VSM **290** is coupled to a vehicle communication bus **212**, and therefore to any other device that is also coupled to vehicle communication bus **212**. The vehicle communication bus is also referred to as a vehicle communication network. In one embodiment, VSM **290** is directly coupled to telematics unit **220**, such as, for example vehicle communication bus **212** coupling telematics unit **220** to vehicle system modules **290**. In an example, vehicle communication bus **212** is a vehicle communication network **112** as described in **FIG. 1**, above. In another embodiment, VSM **290** is indirectly coupled to telematics unit **220**.

VSM **290** includes one or more programs **291** and stored data **292** stored in memory. In one embodiment, program **291** includes software for receiving sensor information and storing the received sensor information at stored data **292**. In this embodiment, the received sensor information is passed to telematics unit **220** for processing, such as, for example to be transmitted from telematics unit **220** to service provider **270**.

FIG. 3 is a flow diagram of an embodiment of a method of managing registration requests of a telematics unit within a telematics equipped mobile vehicle. In **FIG. 3**, method **300** may utilize one or more systems detailed in **FIGS. 1** and **2**, above. The present invention can also take the form of a computer usable medium including a program for configuring an electronic module within a vehicle. The program stored in the computer usable medium includes computer program code for executing the method steps described in **FIG. 3**. In **FIG. 3**, method **300** begins at step **310**.

At step **320**, a restricted use command is received from a service provider. In one embodiment, the restricted use command includes a contact increment, such as, for example contact rate information and contact initiation information. In another embodiment, the restricted use command includes one or more predetermined values.

At step **330**, a restricted use mode is initiated based on the received restricted use command. In one embodiment, the restricted use mode operates the telematics unit in a low-power configuration, such as, for example operating the telematics unit in a "sleep" mode.

At step **340**, a transmission rate of at least one registration request is modulated based on the restricted use mode. In one embodiment, modulating the transmission rate of the registration request includes identifying a contact increment within the received restricted use command, determining contact information within the contact increment, and implementing the modulated transmission rate based on the determined contact information.

At optional step **350**, the telematics unit communicates with a communication network, such as, for example a service provider synchronized with the registration request. In one embodiment, the telematics unit receives an updated contact increment from the service provider. In another embodiment, the telematics unit provides updated telematics information to the service provider. In these embodiments, receiving the updated communication information and providing updated telematics information is synchronized with a registration request. In another embodiment, the updated telematics information includes vehicle location, system energy level, ignition cycles, ignition status and diagnostic trouble codes (DTCs).

In an example, the telematics unit provides updated telematics information, such as, for example GPS information to the service provider synchronized with the registration request. In this example, if the service provider determines that the vehicle has been relocated while in restricted use mode, the service provider can then take appropriate action.

At optional step **360**, an emergency use mode is initiated responsive to an emergency event. In one embodiment, initiating the emergency use mode includes detecting an emergency event and initiating an emergency use mode responsive to the detected emergency event. Examples of an emergency event include vehicle theft, airbag deployment, a predetermined reading from collision sensors and an emergency button press.

In an example, the telematics unit communicates with a service provider when the telematics unit determines that the mobile vehicle has been accessed while the telematics unit is in restricted use mode. In this example, the service provider can then take appropriate action based on the emergency event.

At step **370**, the method is terminated.

The above-described methods and implementation for managing registration requests of a telematics unit within a telematics equipped mobile vehicle are example methods and implementations. These methods and implementations illustrate one possible approach for managing registration requests usage of a telematics unit within a telematics equipped mobile vehicle. The actual implementation may vary from the method discussed. Moreover, various other improvements and modifications to this invention may occur to those skilled in the art, and those improvements and modifications will fall within the scope of this invention as set forth in the claims below.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive.